The ideal radiation detector does not exist however knowing the characteristics of each of the detectors available will allow us to choose the most appropriate for a particular dose measurement. During the last years due to the implementation of new techniques and technologies new detector systems have been commercialized in order to guarantee safe treatment delivery. This talk will review the physical principles of operation of different commercial detectors and how they can be used for reference and relative dose measurements in high energy x-ray beams. Point detectors such as ion chambers, diamonds, diodes, MOSFET and scintillators will be described focusing in their strengths and limitations. Considerations on when and how these detectors should be used will be given. I will also cover briefly 2D measurements using point detectors arrays and radiochromic films.

Teaching Lecture: Secondary cancer after RT: Measuring / estimating organ doses and models of prediction

SP-0197

Secondary cancer after RT: measuring / estimating organ doses and models of prediction

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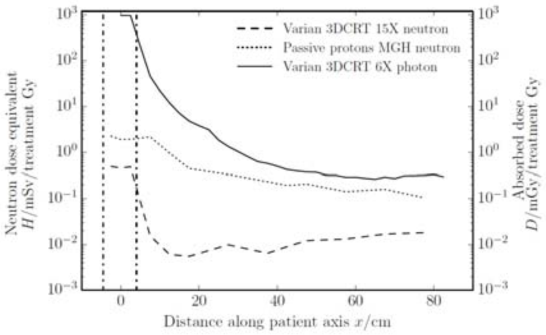
In developed countries more than half of all cancer patients receive radiotherapy at some stage in the management of their disease. However, a radiation induced secondary malignancy can be the price of success if the primary cancer is cured or at least controlled.
With the application of new radiation treatment modalities such as intensity modulated radiotherapy, intensity modulated arc-therapy, proton and heavy ion radiotherapy increased cancer cure rates are expected. However, with the application of these treatment techniques also a larger number of secondary cancers is expected. Some workers believe that we will see an increase in second malignancies due to the substantial increase in beam-on time of IMRT techniques to deliver the same target dose and the different distribution of dose ("low dose to a large volume") compared to conventional treatment techniques. In addition, during proton and heavy ion radiotherapy neutrons are created and could also have an impact on secondary cancer incidence. Therefore it could be of great importance to know the risk for the patient to develop a cancer which could have been caused by the radiation treatment.
The long term risks from modern radiotherapy treatment techniques have not yet been determined and are unlikely to become apparent for many years, due to the long latency time for solid tumor induction. Therefore there is a need to develop models for risk assessment based on the current knowledge of radiation induced carcinogenesis.
The current knowledge of the shape of the dose-response curve for radiation induced cancer for doses larger than a few Gy is reviewed. In patients who receive radiotherapy, parts of the patient volume can receive high doses of up to approximately 100 Gy and it is therefore of great importance to know the dose-response curve of the risk for the patient to develop a cancer which could have been caused by the radiation treatment. These dose-response curves are then used to model second cancer induction for radiotherapy patients based on the three-dimensional dose distribution of the treatment of the primary disease. Current models used for such risk estimates are reviewed.
The three-dimensional dose distributions including the peripheral dose on which the risk modeling is based on is reviewed for different linear accelerators and treatment techniques. In addition the neutron dose of photon and proton treatments is analysed. In the figure the neutron dose equivalent of passive proton therapy (dotted line) is plotted as a function of the distance from the isocenter for a adolescent patient who was treated for a rabdomyosarcoma in the prostate. In comparison the photon scatter dose for a 3DCRT 6 MV treatment plan (solid line) and the neutron dose equivalent of 3DCRT 15 MV (dashed line) therapy is plotted.



Teaching Lecture: Current overview of radiotherapy for breast cancer

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Current overview of radiotherapy for breast cancer

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Technological advances combined with increasing knowledge about the natural course of malignant diseases progressed enormously over the last decades. Improved RT-techniques were, remarkably, only relatively late introduced for treatment of malignant lymphoma and breast cancer, two disease sites where excellent results with a high cure rate and thereby a high demand to avoid long term toxicity are obtained. Especially in breast cancer, still today some departments do not properly delineate target volumes and/or continue to use rather basic RT-techniques.
ESTRO published a consensus guideline for target volume delineation in breast cancer that was developed in five years of work, after obtaining a broad consensus agreement of the RT-community. The next step is now to introduce volume contouring in agreement with these guidelines on a routine base. Personal experience is that, after proper training, it can be done in a very reliable and little time consuming manner. It could also be appropriate to involve, to train and involve RTT for doing this under the responsibility of the radiation oncologist. The downloadable as well as online available fully contoured cases will greatly facilitate this.
Many RT-techniques have been described and are in use, often based on older standard techniques that are adapted and optimized to improve dose homogeneity, treatment positioning or treatment time, while others are based on new technical developments. For sure, the optimal technique for all patients does simply not exist and the most appropriate setup should be chosen based on a combination of the